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(54) Recovery catheter having a rolled tip

Entnahmekatheter mit einer gerollten Spitze

Catheter de recuperation a pointe roulée

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EP 1 232 765 B1

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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates generally to the field of medical catheters. More specifically, the present invention relates to recovery catheters used in distal embolic protection.

2. Description of the Related Art

[0002] Medical catheters are commonly employed for use in a lumen of a patient's body. The catheter enters the patient's body at an access site and is advanced through the lumen to a treatment site. The lumen may be in the patient's vascular system, such as that in a blood vessel, and the treatment site may be a stenosed region where a portion of the lumen is narrowed due to build-up of material on the lumen wall. Such narrowing is known as a stenosis.

[0003] The catheter may be guided to the treatment site through utilization of a guidewire. The guidewire typically is an elongated member having a distal end and a proximal end. The guidewire enters the patient's body at the access site and is advanced through the lumen to the treatment site. The distal end of the guidewire is the end nearest the treatment site, whereas the proximal end is the end nearest the access site. The guidewire may be positioned in proximity to the treatment site such that the distal end of the guidewire is moved to the proximal side of the treatment site (i.e., the side of the treatment site nearest the access site). The distal end of the guidewire may then cross the treatment site, thereby positioning the distal end of the guidewire on the distal side of the treatment site (i.e., the side of the treatment site farthest from the access site).

[0004] Generally, catheters comprise an elongated tubular body having a central lumen in which a guidewire can be received. The catheter is advanced along the guidewire for positioning at the treatment site. The catheter has a distal end that is advanced through the lumen of the patient's body to the treatment site.

[0005] The catheter body may have a diameter that makes it particularly difficult to advance the catheter across the treatment site if a stenosis has significantly narrowed the lumen. The prior art addresses this problem by providing a distal tip of the catheter which is tapered radially inwardly in the distal direction. Such a tapered distal tip allows for the catheter to be advanced through a narrowed portion of the lumen.

[0006] Another problem that may occur is that the catheter can become caught on a stent. A stent, generally, is a tubular wire structure that is positioned within a stenosis to maintain the lumen diameter. When a catheter is advanced across an area having a stent, the distal tip may engage an edge of the stent which can prevent further advancement of the catheter. Catheter advancement past a stent can be especially problematic when the stent is implanted in a curved vessel, or when the stent is underexpanded or incompletely deployed. This problem has been addressed by the prior art by rounding the distal tip or tapering the distal tip down to the approximate outer diameter of the guidewire in order to minimize the surface area available for engagement of the stent. Such a catheter which presents the features according to the preamble of claim 1 is known in particular from document DE-A-1 566 147. This approach also provides for a gradual transition from the wire diameter to the catheter outer diameter, and tends to center the catheter in relation to the stent to facilitate stent crossing.

[0007] Some devices, such as embolic protection devices, may have a host wire that acts as a guidewire for other devices including catheters. An embolic protection device is a collapsible/expandable filter affixed to the distal portion of a guidewire. In the collapsed state, the embolic protection device is compressed toward the guidewire to give the device a smaller diameter so that it can be advanced within the lumen. In the expanded state the embolic protection device deploys outwardly from the guidewire such that it engages the wall of the lumen and acts as a filter by allowing fluid, such as blood, to pass therethrough while preventing emboli or particulate matter entrained in the fluid from passing therethrough. Emboli or particulate matter may become entrained in the fluid when a stenosis is being treated. Such particles of the stenosis may become dislodged due to contact with a treatment apparatus. Such treatments may include ablation procedures such as thrombectomy and atherectomy procedures, balloon angioplasty, stenting, and the like.

[0008] After treatment, the embolic protection device is typically collapsed in a manner wherein it maintains the captured emboli as the device is removed from the lumen. To prevent the release of the emboli back into the fluid, it is preferred to enclose the embolic protection device within a catheter. The collapsed embolic protection device has a proximal periphery that is greater than that of the outer diameter of the guidewire. Prior art catheters for receiving an embolic protection device have a relatively large diameter so as to receive the captured emboli containing protection device. Such catheters can be difficult to advance through a narrowed portion of a vessel or may become caught on a stent. If such catheters are provided with tapered tips, as described above, it becomes difficult to receive an emboli filled protection device within the catheter due to the small diameter of the tapered catheter tip. Alternatively, if prior art catheters are made small in diameter to facilitate stent crossing, it is possible that captured embolic material will be extruded through the distalmost part of the protection device filter during withdrawal of the emboli filled protection device into the small diameter catheter.

[0009] It would be advantageous to provide a catheter

having a distal tip that allows passage of the catheter through a narrowed or stented portion of a lumen, while being able to receive an embolic protection device therein.

[0010] To this end, the invention concerns a catheter according to claim 1.

SUMMARY OF THE INVENTION

[0011] The present invention is an improved catheter for use in recovery of an embolic protection device. It is intended for use in a lumen of a patient's body such as a blood vessel. A distal tip of the catheter permits facile advance through a narrowed portion of the blood vessel, such as a stenosed region, and can conform in a manner to receive, for example, an embolic protection device having a diameter greater than the inner diameter of the distal tip.

[0012] An object of the invention is to provide a catheter that can cross stents or poorly deployed stents and yet can conform in a manner to receive an embolic protection device having a diameter greater than the inner diameter of the distal tip.

[0013] Another object of the invention is to provide a catheter that can cross stents or poorly deployed stents and yet can receive an embolic protection device without causing extruded emboli.

[0014] Yet another object of the invention is to provide a catheter with a large volume capacity that can cross stents or poorly deployed stents.

[0015] Yet another object of the invention is to provide a catheter tip that expands radially while receiving an embolic protection device having a diameter greater than the inner diameter of the distal tip.

[0016] The current invention comprises a tubular member having an inner diameter positionable over a guidewire having a device, such as an embolic protection device, carried proximate the distal end thereof. The distal tip is formed of a compliant material and has an inner diameter less than the diameter of a deployed embolic protection device. The material adapts to conformingly receive the protection device therein as the device is drawn into a lumen in the distal tip.

[0017] A preferred embodiment of the present invention comprises a distal tip attached to a main catheter body. The distal tip is defined by a body having a taper decreasing in a direction toward the distal end. The tubular body defines a wall forming a lumen therein. At the distal end, the wall of the body curves inward toward the lumen, thus forming a rolled tip. The distal tip is made of a compliant material that adapts to conformingly receive a device such as an embolic protection device.

DESCRIPTION OF THE DRAWING FIGURES

[0018]

FIG. 1 is a side sectional view of a distal tip in accordance with the present invention mounted to the distal end of a catheter;

FIG. 2 is a view, similar to FIG. 1, illustrating an alternative embodiment;

FIG. 3 is a view of the present invention illustrating a distal protection device beginning to be drawn therewithin;

FIG. 4 is a view similar to FIG. 3 illustrating the protection device being drawn into the distal tip and deforming the distal end thereof;

FIG. 5 is a view similar to FIGS. 3 and 4 illustrating the diatal tip having captured the protection device.

DETAILED DESCRIPTION OF THE INVENTION

[0019] The device shown in FIG. 1 is suitable for use on a medical recovery catheter. The distal tip 10 comprises a tapered member. The member has a wall 34 that defines a lumen 30. The lumen 30 extends through the length of the distal tip 10. The lumen 30 extends from the proximal end 20 of the distal tip 10 to the distal end 24 of the distal tip 10 to form an aperture through the distal tip 10. The distal end 24 is the end located farthest from the attachment to the main catheter body 40, and the proximal end 20 is the end located nearest the catheter body 40.

[0020] A catheter body 40, suitable for use with the present invention, is a tubular member that has a lumen therethrough, The catheter lumen is in communication with the lumen 30 of the distal tip 10. The catheter lumen 42 is in communication with the lumen 30 of the distal tip 10 when the distal end 44 of the catheter is connected to the proximal end 20 of the distal tip 10. The catheter body may optionally contain a radiopaque marker band 50 in the general vicinity of the distal end 44 of the catheter. The radiopaque marker band may be entirely within the catheter body 40, entirely within the proximal portion of the distal tip, or any combination thereof.

[0021] The wall 34 of the distal tip 10 has a given thickness. The wall thickness can be uniform or be tapered. In one embodiment, the wall 34 has a taper decreasing to a lesser thickness as the wall progresses in the distal direction as shown in Fig. 2.

[0022] The lumen 30 of the distal tip 10 can have a uniform diameter along the length of the distal tip 10 or it may be tapered. In one embodiment, the lumen of the distal tip 30 tapers narrowingly in the distal direction. Thus, the lumen diameter can decrease as it progresses in the distal direction.

[0023] The distal end 24 of the distal tip 10 can have a rolled tip as at 32. The portion of the wall 34 at the distal end 24 of the distal tip 10 can be rolled inward toward the axis 52 of the lumen 30 to form the rolled tip 32.

[0024] The wall 34 of distal tip 10 has an inside surface 36 and an outer surface 38. At the rolled tip 32, end 22 is shown as facing inwardly toward the lumen 30. The end 22 is facing generally radially inwardly. The outer

surface 38, over most of the length of the distal tip 10, faces generally radially outwardly. However, at the rolled tip 32, the outer surface 38 is curved so as to face in the distal direction to define a distal contact surface 26.

[0025] The present invention can be used in the lumen of a human body, such as in a blood vessel 54. The rolled tip 32 is especially designed for crossing a stented or otherwise constricted region of a blood vessel 54. A stent is a generally tubular member having a wire wall defining the boundary of the blood vessel lumen. The catheter must pass through the lumen defined within the stent in order to cross the stented region. As a catheter in accordance with the prior art is advanced within the blood vessel, the distal end of the catheter can become caught against an axial end of the stent. This is particularly true at a curve in the blood vessel 54, or when the stent is underexpanded or incompletely deployed. More specifically, the end of the catheter may engage an axial end of the stent. This can prevent the catheter from being able to advance farther into the blood vessel 54. Similar problems may occur in a constricted or stenosed region of a blood vessel.

[0026] The rolled tip configuration in accordance with the present invention can prevent such problems. A catheter utilizing the distal tip 10, having a rolled tip 32 described herein, is inserted into a blood vessel. The distal tip 10 is advanced to a stented region of the blood vessel. The rolled tip 10 is curved, as previously discussed, such that the outer portion of the wall 34 at the rolled tip 32 defines contact surface 26. As the distal tip 10 is advanced through the region, the contact surface 26 of the rolled tip 32 may engage a stent. The rolled tip 32 prevents the distal tip 10 from becoming impassibly engaged with the stent. As the distal tip 10 is urged across the stented region, the rolled tip 32 may contact the stent, but it will deflect from the point of contact and be urged away from the stent. Thus, where the outer surface 38 contacts the stent, the distal tip 10 can continue advancing past the stent as a result of non-engagement with the axial end of the stent and allowing the distal tip 10 to continue advancing within the blood vessel 54.

[0027] The distal tip 10 can also function to capture, for example, a protection device 58 within the lumen 30. Lumen 30 is of a given diameter. The distal tip 10 is connected to a catheter such that the distal tip lumen 30 is in smooth communication with a catheter lumen 42.

[0028] A device 58 to be captured within the lumen 30 might be, for example, an embolic protection device. A guidewire extends proximal with respect to the protection device 58, extending through the lumen 30 of the distal tip 10 and catheter 40. The device is typically positioned distal to the distal tip 10 and is secured to the guidewire. The protection device 58 has a diameter that is typically greater than that of the distal tip distal end 24.

[0029] Again, the distal tip 10 is made of a compliant material such that the protection device 58 can be facilely received into the distal tip lumen 30. As the protection device 58 is drawn toward the distal tip 10, it will first contact the rolled tip 32 at the contact surface 26. The rolled tip 32 may be urged elastically inward as the device enters the lumen 30 (Fig. 3). After the device 58 has been fully drawn in the proximal direction relative to distal tip 10, the rolled tip 32 reaches a point where it ceases to be engaged by the device, and it will return to its undeflected configuration (Fig. 5). As the device 58 is being drawn into the lumen 30, however, the lumen 30 will adapt to conformingly hold the device 58 therein and rolled tip 32 will expand radially to accommodate the periphery of the device (Fig. 4). The device 58 will eventually have become fully housed within the catheter lumen, and the distal tip 10 returns, as discussed above, substantially to its original configuration.

[0030] It will be understood that resilient material forming the distal tip 10 prevents the escape of emboli when the embolic protection device 58 is captured. At least a portion of the wall of the distal tip 10 closely encompasses the periphery of the protection device 58 and assumes the shape of the periphery. As a result, emboli are prevented from passing between the periphery of the protection device 58 and the wall of the distal tip 10. Emboli within the protection device 58 are prevented from being released back into the blood vessel. Once the protection device 58 has been received within the catheter lumen, the distal tip 10 resumes substantially the size, shape, and dimensions of its original configuration.

[0031] The distal tip 10 is a soft, deformable tip made of an elastic, compliant material. Suitable materials for making the distal tip include thermoplastic polymer and polymer blends or thermoset polymers such as silicone or silicone blends with a low durometer. One such material is a 35/40 D Pebax blend. Any other appropriate compliant materials may, however, be used.

[0032] The polymer tip may be filled with radiopaque materials such as barium sulphate, bismuth subcarbonate, tungsten powder, and the like. The tip 10 can be molded or formed using a heated die or in any other such method. Radiofrequency induction heating, electrical resistance heating, conduction heating, or any other method may be used. The preferred dimensions of the formed tip 10 will, of course, depend on the dimensions of the catheter. For example, a range of catheter sizes is from 4.2 F to 6.0 F, with corresponding inner diameters of 0,107 cm (0.042 inches) and 0,157 cm (0.062 inches), respectively. These catheters might have distal tips with rolled distal inner diameter's of 0,064 cm (0.025) to 0,127 cm (0.050 inches), respectively. The diameter of the distal tip lumen 30 can be constant or tapered toward the distal end. The tip 10 may be attached to the catheter by any appropriate method such as a unitary design, heating, adhesive bonding, or molding.

[0033] It will be understood that this disclosure, in many respects, is only illustrative. Changes may be made in details, particularly in matters of shape, size,

material, and arrangement of parts without exceeding the scope of the invention. Accordingly, the scope of the invention is as defined in the language of the appended claims.

Claims

1. A medical catheter for use in retrieving a medical device (58) from within a body vessel (54), comprising :

   a distal tip member (10) having a wall (34) with an inside surface (36) and an outer surface (38), the wall (34) having a distal end (24) and a proximal end (20) the inside surface (36) defining a lumen (30), the outer surface (38) tapering inwardly toward the distal end (24),

   characterised in that the lumen (30) has a diameter at the distal end (24) that is less than a diameter of the medical device (58), the wall (34) having an undeflected configuration prior to retrieval of the medical device (58) into the lumen (30) and a deflected configuration during retrieval of the medical device into the lumen (30), the distal end (24) being rolled inwardly in the deflected configuration.

2. The catheter according to Claim 1 wherein said tip member (10) tapers radially inwardly toward the distal end (24).

3. The catheter according to Claim 2 wherein the catheter further comprises a main body (40) and wherein said tip member (10) is attached to a distal end (44) of the main body (40) of the catheter.

4. The catheter according to Claim 3 wherein said catheter main body (40) is sized to be positioned within a lumen of a human body.

5. The catheter according to Claim 3 wherein said catheter main body (40) is sized to be positioned within a blood vessel (54).

6. The catheter according to Claim 5 wherein said catheter main body (40) has a lumen (42) sized to receive a guidewire.

7. The catheter according to Claim 1 wherein said medical device (58) is an embolic protection device.

8. The catheter according to claim 1, wherein said wall (34) has a portion at said distal end (24) curved inwardly toward an axis (52) of said tip member (10) lumen (30), and wherein said tip member (10) is formed of a compliant material, such that retrieval of the device (58) expands the lumen (30) diameter to accommodate a diameter of the medical device (58).

9. The catheter according to Claim 8 wherein the catheter further comprises a main body (40) and wherein said distal tip member (10) is attached to a distal end of the main body (40) of the catheter.

10. The catheter according to Claim 9 wherein said catheter main body (40) is sized to be advanced within a blood vessel (54).

11. The catheter according to Claim 10 wherein said catheter main body (40) has a lumen (42) and said catheter main body (40) is sized to be advanced over a guidewire extending through lumen (42).

12. The catheter according to Claim 11 wherein said curved portion is shaped such that as said medical device (58) is drawn into said distal tip member (10), a portion of said medical device (58) contacts a portion of said outer surface (38) of said curved portion of said wall (34).

13. The catheter wherein according to Claim 12 wherein said curved portion is sized to accommodate said medical device (58) into said lumen (30) of said distal tip member (10).

14. The catheter according to claim 8 wherein said distal tip member (10) has a diameter that decreases as it progresses towards said curved portion.

15. The catheter according to claim 1, wherein the wall (34) defining the lumen (30) has a periphery wherein said distal tip member (10) has an inward taper from the proximal end (20) towards the distal end (24) and wherein at said distal end (24) said wall (34) curves inwardly towards said lumen (30) such that when a medical device (58) having a greater periphery is urged into said lumen (30), said lumen (30) adapts to conformingly receive the medical device (58) having said greater periphery.

16. The catheter according to Claim 15 wherein the catheter further comprises a main body (40) and wherein said distal tip member (10) is attached to a distal end of the main body (40) of the catheter.

17. The catheter according to Claim 16 wherein said catheter main body (40) is sized to be positioned within a lumen of a patient's body.

18. The catheter according to claim 1, further comprising a main body (40) having at least a single tubular member, said tubular member extending to a distal end; and the distal tip member (10) connected to and in communication with distal end of said main

body (40) and wherein said distal tip member (10) wall (34) forms a boundary about the lumen (30) wherein said wall (34) has a thickness that is tapered towards a smaller dimension at distal end (24), said distal end (24) of said wall (34) being rolled inwardly towards said lumen (30) forming a rolled tip (32), said rolled tip (32) being sized to receive a protection device (58) into said lumen (30).

19. The catheter according to claim 3, wherein the main body (40) is at least partly radiopaque.

20. The catheter according to claim 1, wherein the distal tip member (10) is at least partly radiopaque.

Patentansprüche

1. Medizinischer Katheter zum Einsatz beim Wiederfinden eines medizinischen Apparats (58) innerhalb einer Körperhöhle (54), mit:

einem distalen Neigungsglied (10) mit einer Wand (34) mit einer inneren Fläche (36) und einer äußeren Fläche (38), wobei die Wand (34) ein distales Ende (24) und ein proximales Ende (20) hat, wobei die innere Fläche (36) ein Lumen (30) definiert, wobei die äußere Fläche (38) zum distalen Ende (24) hin nach innen eingezogen ist,

dadurch gekennzeichnet, dass das Lumen (30) am distalen Ende (24) einen Durchmesser hat, der kleiner ist als ein Durchmesser des medizinischen Apparats (58), wobei die Wand (34) vor dem Wiederfinden des medizinischen Apparats (58) in dem Lumen (30) eine ungebogene Konfiguration und eine gebogene Konfiguration während des Wiederfindens des medizinischen Apparats in dem Lumen (30) hat, wobei das distale Ende (24) in der gebogenen Konfiguration nach innen eingerollt ist.

2. Katheter gemäß Anspruch 1, in dem das besagte Neigungsglied (10) radial in Richtung zum distalen Ende (24) einwärts eingezogen ist.

3. Katheter gemäß Anspruch 2, in dem der Katheter darüber hinaus einen Hauptkörper (40) umfasst und in dem das genannte Neigungsglied (10) an einem distalen Ende (44) des Hauptkörpers (40) des Katheters befestigt ist.

4. Katheter gemäß Anspruch 3, in dem der genannte Katheterhauptkörper (40) derart bemessen ist, dass er innerhalb eines Lumens eines menschlichen Körpers positioniert ist.

5. Katheter gemäß Anspruch 3, in dem der genannte Hauptkörperkatheter (40) derart bemessen ist, dass innerhalb eines Blutgefäßes (54) positioniert ist.

6. Katheter gemäß Anspruch 5, in dem der genannte Katherhauptkörper (40) ein Lumen (42) hat, das derart bemessen ist, dass es einen Führungsdraht aufnimmt.

7. Katheter gemäß Anspruch 1, in dem der genannte medizinische Apparat (58) eine embolische Schutzvorrichtung ist.

8. Katheter gemäß Anspruch 1, in dem die genannte Wand (34) einen nach innen in Richtung zu einer Achse (52) des genannten Neigungsgliedes (10) des Lumens (30) gekrümmten Abschnitt an dem genannten distalen Ende (24) hat und in dem das genannte Neigungsglied (10) aus einem kompatiblen Material gebildet wird, so dass das Wiederfinden des Apparats (58) den Lumen(30-Durchmesser ausdehnt, um einen Durchmesser des medizinischen Apparats (58) anzupassen.

9. Katheter gemäß Anspruch 8, in dem der Katheter darüber hinaus einen Hauptkörper (40) umfasst und in dem das genannte Neigungsglied (10) an einem distalen Ende des Hauptkörpers (40) des Katheters befestigt ist.

10. Katheter gemäß Anspruch 9, in dem der genannte Katheterhauptkörper (40) derart bemessen ist, dass er innerhalb eines Blutgefäßes (54) vorgeschoben wird.

11. Katheter gemäß Anspruch 10, in dem genannter Katherhauptkörper (40) ein Lumen (42) hat und genannter Katherhauptkörper (40) derart bemessen ist, dass er über einen sich durch das Lumen (42) erstreckenden Führungsdraht vorgeschoben wird.

12. Katheter gemäß Anspruch 11, in dem der genannte gekrümmte Abschnitt derart geformt ist, dass, wenn der genannte medizinische Apparat (58) in den genannte distale Neigungsglied (10) gezogen wird, ein Abschnitt des genannten medizinischen Apparats (58) mit einem Abschnitt der genannten äußeren Fläche (38) des genannten gekrümmten Abschnitts der genannten Wand (34) in Kontakt kommt.

13. Katheter gemäß Anspruch 12, in der genannte gekrümmten Abschnitt derart bemessen ist, dass der genannte medizinischer Apparat (58) in das genannte Lumen (30) des genannten distalen Neigungsgliedes (10) eingepasst wird.

14. Katheter gemäß Anspruch 8, in dem das genannte

distale Neigungsglied (10) einen Durchmesser hat, der mit seinem Fortschreiten in Richtung des genannten gekrümmten Abschnitts abnimmt.

15. Katheter gemäß Anspruch 1, in dem die das Lumen (30) definierende Wand (34) eine Peripherie hat, in der das genannte distale Neigungsglied (10) einen vom proximalen Ende (20) zum distalen Ende (24) inneren Einzug hat und in dem an dem genannten distalen Ende (24) die genannte Wand (34) sich in Richtung des genannten Lumens (30) derart nach innen krümmt, dass, wenn ein medizinischer Apparat (58) mit einer größeren Peripherie in das genannte Lumen (30) getrieben wird, das genannte Lumen (30) sich entsprechend anpasst, um den medizinischen Apparat (58) mit der genannten größeren Peripherie aufzunehmen.

16. Katheter gemäß Anspruch 15, in dem der Katheter darüber hinaus einen Hauptkörper (40) umfasst und in dem das genannte distale Neigungsende (10) an einem distalen Ende des Hauptkörpers (40) des Katheters befestigt ist.

17. Katheter gemäß Anspruch 16, in dem der genannte Katheterhauptkörper (40) derart bemessen ist, dass er in ein Lumen eines Patientenkörpers positioniert wird.

18. Katheter gemäß Anspruch 1, darüber hinaus mit einem Hauptkörper (40) mit wenigstens einem einzigen röhrenförmigen Element, wobei das genannte röhrenförmige Element sich zu einem distalen Ende erstreckt; und das entfernte Neigungsglied (10) an das distale Ende des genannten Hauptkörpers (40) angeschlossen und mit ihm verbunden ist, in dem die Wand (34) des genannten distalen Neigungsgliedes (10) eine Begrenzung um das Lumen (30) bildet, in dem die genannte Wand (34) eine Dicke hat, die in Richtung zu einer kleineren Abmessung des distalen Endes (24) eingezogen ist, wobei das genannte distale Ende (24) der genannten Wand (34) in Richtung des genannten Lumens (30) eingerollt ist und eine gerollte Neigung (32) bildet, wobei die genannte eingerollte Neigung (32) derart bemessen ist, dass in das genannte Lumen (30) eine Schutzvorrichtung (58) aufgenommen wird.

19. Katheter gemäß Anspruch 3, in dem der Hauptkörper (40) wenigstens teilweise strahlenundurchlässig ist.

20. Katheter gemäß Anspruch 1, in dem das distale Neigungsglied (10) wenigstens teilweise strahlenundurchlässig ist.

Revendications

1. Cathéter médical destiné à être utilisé pour récupérer d'un dispositif médical (58) de l'intérieur d'un vaisseau corporel (54), comprenant :

   un élément d'extrémité distale (10) ayant une paroi (34) avec une surface intérieure (36) et une surface extérieure (38), la paroi (34) ayant une extrémité distale (24) et une extrémité proximale (20), la surface intérieure (36) définissant une lumière (30), la surface extérieure (38) étant effilée vers l'intérieur en direction de l'extrémité distale (24),

   caractérisé en ce que la lumière (30) a un diamètre à l'extrémité distale (24) qui est inférieur à un diamètre du dispositif médical (58), la paroi (34) ayant une configuration non déviée avant la récupération du dispositif médical (58) dans la lumière (30) et une configuration déviée durant la récupération du dispositif médical dans la lumière (30), l'extrémité distale (24) étant enroulée vers l'intérieur dans la configuration déviée.

2. Cathéter selon la revendication 1, dans lequel ledit élément d'extrémité (10) est effilé radialement vers l'intérieur en direction de l'extrémité distale (24).

3. Cathéter selon la revendication 2, dans lequel le cathéter comprend en outre un corps principal (40) et dans lequel ledit élément d'extrémité (10) est fixé à une extrémité distale (44) du corps principal (40) du cathéter.

4. Cathéter selon la revendication 3, dans lequel ledit corps principal de cathéter (40) est dimensionné pour être positionné à l'intérieur d'une lumière d'un corps humain.

5. Cathéter selon la revendication 3, dans lequel ledit corps principal de cathéter (40) est dimensionné pour être positionné à l'intérieur d'un vaisseau sanguin (54).

6. Cathéter selon la revendication 5, dans lequel ledit corps principal de cathéter (40) a une lumière (42) dimensionnée pour recevoir un fil guide.

7. Cathéter selon la revendication 1, dans lequel ledit dispositif médical (58) est un dispositif de protection embolique.

8. Cathéter selon la revendication 1, dans lequel ladite paroi latérale (34) a une partie à ladite extrémité distale (24) incurvée vers l'intérieur vers un axe (52) de ladite lumière (30) dudit élément d'extrémité (10), et dans lequel ledit élément d'extrémité (10)

est réalisé dans un matériau flexible, de manière à ce que la récupération du dispositif (58) élargisse le diamètre de la lumière (30) pour qu'elle s'adapte à un diamètre du dispositif médical (58).

9. Cathéter selon la revendication 8, dans lequel le cathéter comprend en outre un corps principal (40) et dans lequel ledit élément d'extrémité distale (10) est fixé à une extrémité distale du corps principal (40) du cathéter.

10. Cathéter selon la revendication 9, dans lequel ledit corps principal de cathéter (40) est dimensionné pour être 'avancé à l'intérieur d'un vaisseau sanguin (54).

11. Cathéter selon la revendication 10, dans lequel ledit corps principal de cathéter (40) a une lumière (42) et ledit corps principal de cathéter (40) est dimensionné pour être avancé sur un fil guide s'étendant dans la lumière (42).

12. Cathéter selon la revendication 11, dans lequel ladite partie incurvée est formée de manière à ce que, alors que ledit dispositif médical (58) est aspiré dans ledit élément d'extrémité distale (10), une partie dudit dispositif médical (58) entre en contact avec une partie de ladite surface extérieure (38) de ladite partie incurvée de ladite paroi (34).

13. Cathéter selon la revendication 12, dans lequel ladite partie incurvée est dimensionnée de manière à loger ledit dispositif médical (58) dans ladite lumière (30) dudit élément d'extrémité distale (10).

14. Cathéter selon la revendication 8, dans lequel ledit élément d'extrémité distale (10) a un diamètre qui diminue alors qu'il avance en direction de ladite partie incurvée.

15. Cathéter selon la revendication 1, dans lequel la paroi (34) définissant la lumière (30) a une périphérie, dans lequel ledit élément d'extrémité distale (10) est effilé en direction de l'intérieur depuis l'extrémité proximale (20) vers l'extrémité distale (24) et dans lequel à ladite extrémité distale (24) ladite paroi (34) s'incurve vers l'intérieur en direction de ladite lumière (30) de manière à ce que, lorsqu'un dispositif médical (58) ayant une périphérie plus grande est poussé dans ladite lumière (30), ladite lumière (30) s'adapte pour recevoir, en s'adaptant à sa forme, le dispositif médical (58) ayant ladite périphérie plus grande.

16. Cathéter selon la revendication 15, dans lequel le cathéter comprend en outre un corps principal (40) et dans lequel ledit élément d'extrémité distale (10) est fixé à une extrémité distale du corps principal (40) du cathéter.

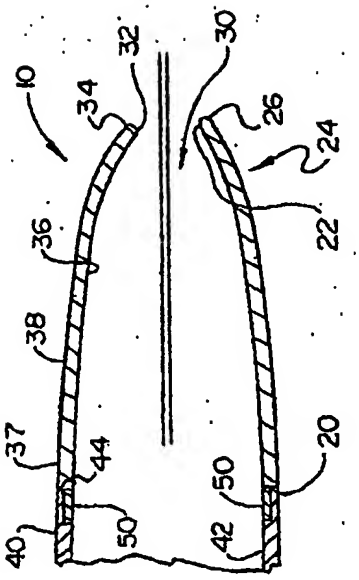
17. Cathéter selon la revendication 16, dans lequel ledit corps principal de cathéter (40) est dimensionné pour être positionné à l'intérieur d'une lumière du corps d'un patient.

18. Cathéter selon la revendication 1, comprenant en outre un corps principal (40) ayant au moins un élément tubulaire simple, ledit élément tubulaire s'étendant vers une extrémité distale ; et l'élément d'extrémité distale (10) raccordé à et communiquant avec l'extrémité distale dudit corps principal (40), et dans lequel ladite paroi (34) dudit élément d'extrémité distale (10) forme une frontière autour de la lumière (30), dans lequel ladite paroi (34) a une épaisseur qui est effilée vers une plus petite dimension à l'extrémité distale (24), ladite extrémité distale (24) de ladite paroi (34) étant enroulée vers l'intérieur en direction de ladite lumière (30) formant une extrémité enroulée (32), ladite extrémité enroulée (32) étant dimensionnée pour recevoir un dispositif de protection (58) dans ladite lumière (30).

19. Cathéter selon la revendication 3, dans lequel ledit corps principal (40) est au moins partiellement radio-opaque.

20. Cathéter selon la revendication 1, dans lequel l'élément d'extrémité distale (10) est au moins partiellement radio-opaque.

Fig. 1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34
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24
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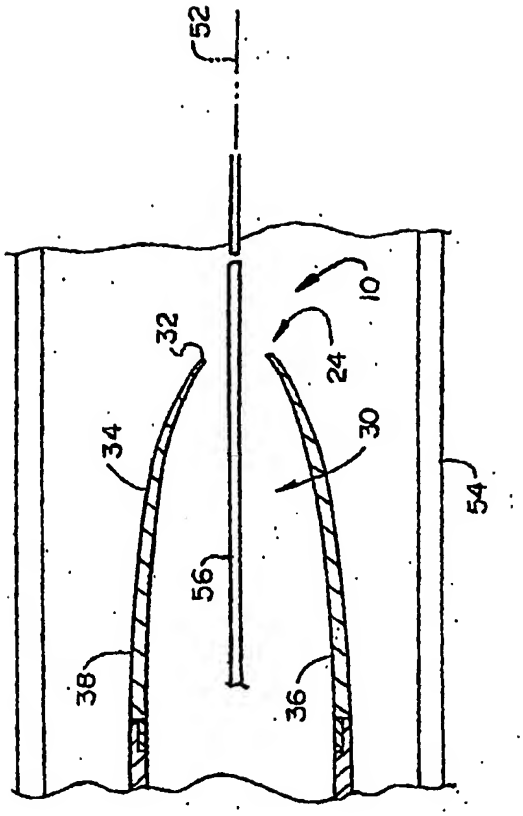
42

Fig. 2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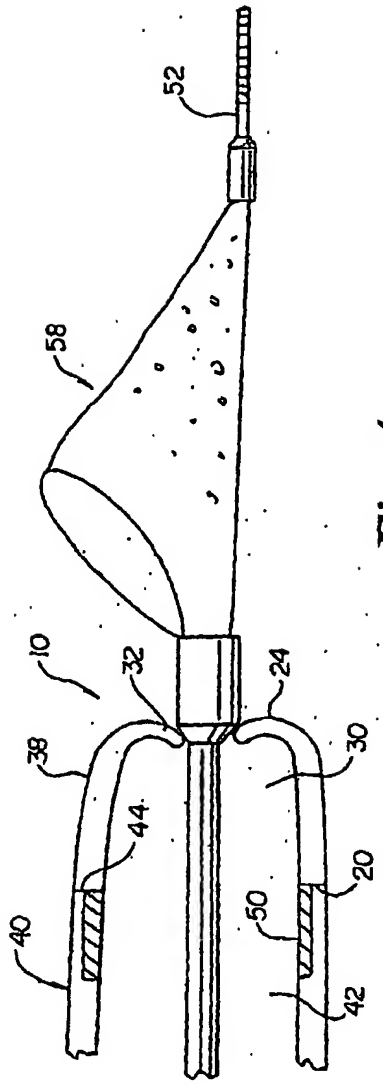
24
34
30
54
56
38
36

Fig. 3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58
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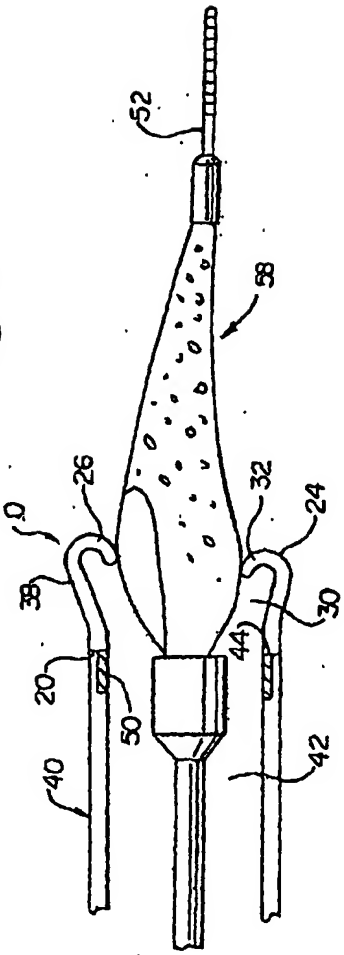
32
24
38
30
44
20
50
40
42

Fig. 4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58
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40
42

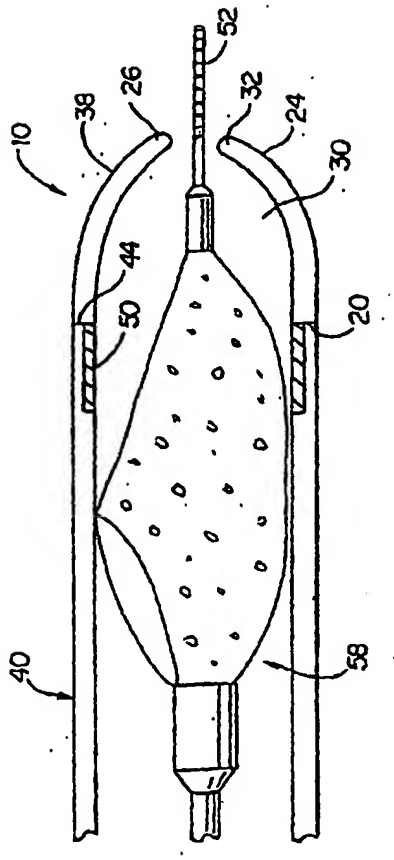

Fig. 5